December 2014

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Article *in* Journal of the Pakistan Medical Association · December 2014

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ORIGINAL ARTICLE

Malrotation after reamed intramedullary nailing with and without a fracture table for closed fractures of the femoral shaft

Rizwan Haroon Rashid, Akbar Jaleel Zubairi, Masood Umer

Abstract

Introduction: To observe the effect of the choice of surgical table on the incidence of malrotation.

Methods: The randomised trial was conducted from July 2012 to January 2013 at the Aga Khan University Hospital, Karachi, during which 74 patients were inducted. Randomisation was done via random allocation software version 1.0.0 and sealed envelopes were used to guide the choice of table. Malrotation was assessed by the operating surgeon using the lesser trochanteric shape signunder intra-operative fluoroscopy. SPSS 19 was used for statistical analysis.

Results: The 74 patients in the study were divided into two groups of 37(50%) each using fracture table and the regular table.Overall, there were 55(74%) male and 19(26%) female patients with a mean age of 37±17 years. Overall incidence of malrotation was 13(17.6%). Malrotation was observed in 7(19%)patients in the fracture table group and 6(16%)in the regular table group (p=0.760).

Conclusion: The choice of fracture table did not influence the occurrence or direction of malrotation.

Keywords: Femoral fractures, Fracture fixation intramedullary, Traction, Supine position, Patient positioning. (JPMA 64: S-3 (Suppl. 2); 2014)

Introduction

Intramedullary (IM) nailing is the accepted standard of care for femoral shaft fractures. It may be performed after open or closed reduction in the supine position on the fracture table or in the lateral position on a regular radiolucent table. Both these techniques have reported satisfactory outcomes and hence are widely practised all over the world.[1,2]

Overall complications of femoral nailing are low among which malrotation is a common but under-recognised complication reported in up to 27.6% patients. This may be due to variation in normal anatomy and partly due to difficulty in accurate intra-operative assessment of rotation.[3,4]

Even though long-term clinical consequences of malrotation remain unclear, the choice of table, patient positioning, obesity, fracture pattern and anatomical profile of the femur have been implicated as possible reasons for its occurrence.[5]

As recent literature suggests that the choice of table may influence malrotation, the current study was designed to radiologically observe the effect of choice of table on the incidence of malrotation after femoral nailing.

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Patients and Methods

The randomised trial was conducted from July 2012 to January 2013 at the Aga Khan University Hospital, Karachi, after approval from the institutional ethics review committee. Using World Health Organisation (WHO) sample size calculator, applying formula for hypothesis test for two population proportions (one-sided test), keeping level of significance at 5%, power at 80%, anticipated population proportions in the two groups as 0.29 and 0.07,[4] a sample size of 37 was calculated for each group.

All patients between the ages of 15 and 65 years, presenting at the emergency room with traumatic femoral shaft fractures within four weeks of the injury and were planned for IM nailing were included. Patients with pathological fractures, bilateral femur fractures and non-unions were excluded.

Written informed consent was obtained from the subjects and they were blinded to the type of table used. Randomisation was done using random allocation software version 1.0.0. Sealed coded envelopes were placed in the operating rooms, containing the group allocation (A: supine position onfracture table; B: lateral position on regular table) for sequential patients. At the time of surgery, the operating team opened the envelope and performed surgery according to the allocation. All patients were assessed intra-operatively under fluoroscopic guidance by the operating surgeon for

malrotation using lesser trochanteric shape sign as described in literature.[6]

Data analysis was performed using SPSS 19. Both groups were compared for age and gender using student's t-test and chi square test respectively. Chi square test was used to compare the frequency of malrotation between the groups with significance at $p < 0.05$.

Results

The 74 patients were randomised into two equal groups of 37(50%) each.

Overall, there were 55(74%) male and 19(26%) female patients with a mean age of 37±17 years. The right femur was operated upon in 41(55.5%) patients and in the remaining 33(44.5%) patients the left femur was operated upon. The two groups were comparable in terms of age, gender distribution and side operated (Table-1).

Overall malrotation was observedin 13(17.6%) patients after IM nailing of femur. Among these patients, 10 (76.9%) had internal rotation and 3(23.1%) had external rotation.

In the fracture table group, 7(19%) had malrotation with 6(86%) showing internal rotation and 1(14%) external rotation. In comparison, 6(16%) patients in the regular table group showed malrotation with 4(67%) having internal rotation and 2(33%) external rotation. Even though there was a trend of increased internal rotation in the fracture table group and external rotation in the regular table group, no statistically significant difference was observed between the two groups (p=0.760) (Table-2).

Table-1: Patient Characteristics.

Group	Group A (Fracture table)	Group B (Regular table)
Number of Patients(n)	37	37
Age(Mean ±SD)	38±17.73	36±16.17
Gender		
Male	29	26
Female	8	11
Side		
Right	20	21
Left	17	16

Table-2: Comparison of malalignment.

Type of Table	No Malalignment	Malalignment	P- value
Fracture Table (Group A)	30	7	0.760
Regular Table (Group B)	31	6	

Discussion

Malrotation is a common but difficult complication to detect radiographically and clinically, and it is often under-appreciated.[3,7] Wolinsky et al emphasised the need of further research which could delineate whether malrotation after IM nailing is affected by the type of table or not.[8]

Even though both type of tables for IM nailing are accepted and widely used,they have their own inherent advantages and disadvantages along with a learning curve.[9]

The advantage of using a fracture table over a regular table for femoral nailing is that the procedure may be performed with limited assistance from other scrubbed personnel.[4] On the other hand, there are well documented complications related to prolonged traction on a fracture like pudendal nerve palsy, perineal sloughs and well-leg compartment syndrome which are not a concern on a regular table.[10-12]

Aprospective randomised control study found that patients operated on a fracture table had a higher incidence of internal rotation malignment (29%) compared to those operated on the regular table (7%).[4] One of the probable causes of this internal rotation malignment caused by fracture table may be explained by forceful internal rotation of the limb to aid in making the entry point and to improve the fluoroscopic image of the proximal femur in the lateral plane.[3] Further, when the limb is placed in the hemi-lithotomy position on the fracture table, it is difficult to compare rotation as that limb is not readily movable.[13] With manual traction, both limbs may be imaged with fluoroscopy and rotation compared with the uninjured limb using the lesser trochanter and patella as landmarks.[6,14-17]

Our study revealed a 17% incidence of malrotation after IM nailing of femur which is in accordance with that reported in literature.[3,5] It also showed an increased trend of internal rotation in the fracture table group, but this difference was not statistically significant.

Whether malrotation after IM nailing has a long-term effect or not has not been studied in detail. A study found that malrotation of a femoral shaft fracture is not just a cosmetic problem.[18] External rotation of any degree at the proximal fourth, mid-shaft, and distal fourth may cause a posterior shift of the weight-bearing axis in the sagittal plane, resulting in gait abnormalities.[7,19] Similarly,in the frontal plane it may cause eccentric stresses,resulting in early knee osteoarthritis.[20-22] There are no recent long-term clinical studies reported in literature to demonstrate

these effects.

Conclusion

The choice of fracture table did not seem to influence the occurrence or the direction of malrotation. But even so, malrotation occurs in a significant number of patients during femoral IM nailing and should be checked and corrected by the operating surgeon before locking the nail. The long-term consequences of malrotation are not known and further research on this subject is warranted.

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